REMARKS/ARGUMENTS

Applicant respectfully requests reconsideration of this application in view of the foregoing amendments to the specification and claims and the following comments.

In the Office Action mailed September 10, 2004, claims 1-14 and 23-24 were examined. Claim 7 was expressly withdrawn from consideration pursuant to 37 C.F.R. § 1.142(b), as allegedly directed to a non-elected species. Although not stated in the Office Action, claims 15-22 and 25-31 also were withdrawn from consideration, as directed to one or more non-elected species.

On pages 2-5 of the Office Action, claims 1-6, 8-14, and 23-24 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. Further, on page 5 of the Office Action, the specification was objected to as allegedly failing to provide proper antecedent basis for the claimed subject matter. Further, on pages 5-6 of the Office Action, claim 9 was objected to as allegedly being in improper dependent form.

Further, on pages 6-9 of the Office Action, claims 1-6, 8-14, and 23-24 were rejected under 35 U.S.C. § 103(a), as allegedly obvious over U.S. Patent No. 4,486,212 to Berkey (the "Berkey patent") in view of U.S. Patent No. 4,317,667 to Spainhour (the "Spainhour patent"), and claims 1, 5, and 8 were rejected as allegedly obvious over U.S. Patent No. 5,922,100 to Cain et al. (the "Cain patent") in view of the Spainhour patent.

Applicant respectfully traverses these rejections, for the reasons set forth below.

The Election of Species Requirement

As mentioned above, the Examiner has withdrawn claim 7 from further consideration, pursuant to 37 C.F.R. § 1.142(b), as allegedly drawn to a non-elected species. Specifically, the Examiner asserted that the claim term "radially outward" requires a circular configuration, in which case the claim corresponds to non-elected species A.

Applicant respectfully disagrees. The term "radially outward" does not require a circular configuration. On the contrary, it merely requires that the shield gas ports be arranged outward of the flame ports, along radii originating from the burner's central axis. This is

consistent with the following definition of the term "radial," taken from Merriam-Webster On-Line Dictionary (www.m-w.com):

> "1 : arranged or having parts arranged like rays
> 2 a : relating to, placed like, or moving along a radius b : characterized by divergence from a center.
> . . ."

Regardless, this issue is moot in view of Applicant's amendment to claim 7, which deletes the term "concentrically" and "radially." A similar amendment has been made to parent claim 6. Amended claim 7 now specifies merely that the main deposition burner further comprises "a second plurality of shield gas ports, arranged outward of the plurality of flame ports, for forming an outer shield gas stream outward of the flame." In view of this amendment, claim 7 should now be substantively examined.

The Rejection of Claims 1-6, 8-14, and 23-24 Under 35 U.S.C. § 112, Second Paragraph

As mentioned above, claims 1-6, 8-14, and 23-24 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. A number of specific examples of alleged indefiniteness were set forth. These examples are discussed in order below.

Regarding all of claims 1-6, 8-14, and 23-24, the Examiner asserted as follows:

> "The term 'port' is indefinite as to its meaning. According to Examiner's dictionary a port is an opening. However as can bee [sic] seen from figures 8-9 (for example) 40a-c points to a tube rather than an opening. It is clear that applicant is using the term 'port' to be broader in scope than a mere 'opening'; however it is unclear as to what that broader scope is. It is well settled case law that if Applicant wishes to give a new definition to a term—such a definition must be clearly indicated in the specification. Also, it is new matter to add a new definition after the filing date."

Applicant respectfully disagrees. The claim term "port" is being used to refer to an opening through which a stream of reactants, shield gases, or flame gases can pass. The term is *not* being used in a new way; on the contrary, it is being used according to its normal dictionary meaning. Merriam-Webster's On-Line Dictionary (www.m-w.com) provides the following applicable definition:

> "...
> 2 a : an opening (as in a valve seat or valve face) for intake or exhaust of a fluid
> ..."

In commenting on the term "port," the Examiner asserted that FIGS. 8-9 of the application use the reference numerals 40a-c to identify tubes rather than openings. That is correct—reference numerals 40a-c do, in fact, identify tubes. Some of the ports being defined in the claims correspond to the outlets of the passageways through these tubes. It also is important to note that identifying these passageway outlets as "ports" has been carried forward from the originally filed application. Original claim 16, for example, defined "a central reactant *port* that forms a central stream of soot-forming reactants" and "a pair of supplemental reactant *ports* located on opposite sides of the central reactant port, for forming supplemental streams of soot-forming reactants that diverge from the central axis."

Regarding independent claims 1 and 13, the Examiner asserted "there doesn't appear to be antecedent basis for 'the glass preform' because the preform isn't part of the structure." Applicant does not understand the Examiner's assertion, but notes that perhaps the Examiner has overlooked the earlier references to "*a* glass preform" (claim 1, lines 1 and 9, and claim 13, lines 1 and 8).

Regarding claim 3, the Examiner asserted "there is confusing antecedent basis for 'auxiliary burners'—it is unclear whether they are additional auxiliary burners or if the claim further limits the auxiliary burners of claim 2." In response, Applicant has amended claim 3 to state that "the one or more auxiliary burners comprise one or more pairs of auxiliary burners." This should clarify that the burners defined in claim 3 are included in burners defined in parent claim 2.

Regarding claim 5, the Examiner asserted "there is no antecedent basis for 'the flame' of line 6." In response, Applicant has amended claim 5 to call for "*a* flame."

Regarding claim 9, the Examiner asserted that the term "asymmetrically" is indefinite. In response, Applicant has deleted the term "asymmetrically" from the claim. Applicant also has amended the claim to clarify that the flame is "directed" along a path, as contrasted with "oriented" along a path.

Regarding claim 14, the Examiner asserted "there is no antecedent basis for 'the streams at the site of the preform' or for 'the site of the preform,'" and he further asserted "there is confusing antecedent basis for the streams of soot-forming reactants." In response, Applicant has amended claim 14 to specify that turbulence is being reduced in "the streams of soot-forming reactants at the site of the preform."

Regarding claims 1 and 14, the Examiner asserted "'at the site of the preform' the streams of reactants no longer exists [sic] . . .because the reactants no longer exists [sic]—they would have been converted to soot." Applicant respectfully disagrees. The streams of soot-forming reactants still exist as streams at the site of the preform, even though a substantial portion of the reactants have been converted to soot. In addition, Applicant directs the Examiner's attention to FIG. 7 of the drawings, which depicts the streams flowing past the glass preform.

Finally, regarding claims 23-24, the Examiner asserted that these claims incorporate "means-plus-function" limitations, yet "there is no mention of the 'means' in the specification." From this, the Examiner concludes "*[t]hus* the specification fails to show what is meant by the language." Applicant respectfully disagrees. Whether or not a means-plus-function limitation satisfies the definiteness requirement of § 112, second paragraph, is determined based on what one skilled in the art would have understood from the specification. *Budde v. Harley-Davidson, Inc.*, 250 F.3d 1369 at 1376 (Fed. Cir. 2001). Moreover, it is *not* necessary to use the term "means" in the specification for persons skilled in the art to know what is meant by the claim language. *Creo Prods., Inc. v. Presstek, Inc.*, 305 F.3d 1337 (Fed. Cir. 2002).

In this case, it should be clear to one of ordinary skill in the art that the recited means (i.e., "means for supplying reactant gases . . . and for supplying flame gases . . .") corresponds to the various conduits, valves, gas chambers, and tubes described in the specification and depicted in the drawings. For this reason, it is not necessary for the specification to explicitly refer to this structure using the term "means"; nor is it necessary to explicitly state that this structure corresponds to the recited means-plus-function claim limitation. It is enough for those of ordinary skill in the art to understand what structure disclosed in the specification performs the functions of supplying reactant gases and supplying flame gases.

In view of these claim amendments and arguments, the rejection of claims 1-6, 8-14, and 23-24 under 35 U.S.C. § 112, second paragraph, should now be withdrawn.

Objection to the Specification

Also as mentioned above, the Examiner objected to the specification, as allegedly failing to provide proper antecedent basis for the claimed subject matter. Specifically, the Examiner noted that the claim terms "divergent reactant ports" and "means for supplying reactant gases . . ." must also be included in the specification.

In response, Applicant has amended the specification to specify that the lateral feed tubes 40a,c are oriented to diverge from the center feed tube 40b. Persons skilled in the art will understand that the ports defined by these tubes, likewise, are divergent.

Applicant has not amended the specification to specify what particular structure corresponds to the claimed "means for supplying reactant gases . . .," because it is not necessary to do so. It suffices that persons skilled in the art would readily understand what structure disclosed in the specification performs this function. *Budde v. Harley-Davidson, Inc., supra.*

For these reasons, the objection to the specification should be withdrawn.

Objection to Claim 9

Also as mentioned above, the Examiner objected to claim 9 under 37 C.F.R. § 1.75(c), as being of improper dependent form, for allegedly failing to further limit the subject

matter of a previous claim. In response, Applicant has amended claim 9 to depend from claim 5, instead of from claim 8. For this reason, this objection to claim 9 should be withdrawn.

The Rejection of Claims 1-6, 8-14, and 23-24 Under 35 U.S.C. § 103(a)

Also as mentioned above, claims 1-6, 8-14, and 23-24 were rejected under 35 U.S.C. § 103(a), as allegedly obvious over the Berkey patent in view of the Spainhour patent. In addition, claims 1, 5, and 8 were rejected as allegedly obvious over the Cain patent in view of the Spainhour patent. These rejections are addressed below.

The Rejection of Claims 1-6, 8-14, and 23-24 Based on the Berkey and Spainhour Patents

In this rejection, the Examiner asserted that "Berkey discloses the invention as claimed—except for the chamber." Applicant respectfully disagrees. The Berkey patent does, in fact, disclose a flame hydrolysis apparatus for depositing glass soot onto a mandrel. However, that apparatus fails to include a deposition burner at all like the deposition burner defined in Applicant's claims.

Independent claim 1 defines the apparatus to include a main deposition burner having, among other features, "a pair of *divergent reactant ports* for producing two of the streams of soot-forming reactants . . ." Berkey's deposition burner lacks such a pair of divergent reactant ports.

On this point, the Examiner asserted that Figure 11 of the Berkey patent "shows the orifices 80' which would have been on either side of the preform to quasi-tangentially impinge on the preform." Applicant agrees that the orifices (or ports) 80' are, in fact, divergent; however, those orifices carry *shield gases, not soot-forming reactants.* Shield gases, of course, are very different from the required soot-forming reactants. For this reason, alone, the Berkey patent fails to disclose the required main deposition burner. Moreover, the Spainhour patent fails to make up for this deficiency of the Berkey patent.

Also in connection with independent claim 1, the Examiner asserted as follows: "[i]mpinging and turbulence related limitations are method limitations not structural." Applicant respectfully disagrees. The requirement that the two streams of soot-forming reactants "impinge

substantially quasi-tangentially on the glass preform" is, in fact, a structural limitation, because it is achieved in part by a structural orientation of the pair of divergent reactant ports. Further, the requirement "to reduce turbulence in the streams at the site of the preform," likewise, is structural, because it too is achieved in part by a structural orientation of the pair of divergent reactant ports. Regardless, this issue is moot in view of the failure of the Berkey and Spainhour patents to show or suggest a flame hydrolysis apparatus incorporating the recited main deposition burner.

Claims 2-6, 8-12, and 23 all depend from independent claim 1, adding additional structural features that further distinguish over the Berkey and Spainhour patents. These claims are discussed in order below.

Claim 2 depends from independent claim 1 and more particularly defines the apparatus to include one or more auxiliary burners configured to introduce one or more streams of flame gases, but no stream of soot-forming reactants, toward the glass preform, and also to include a controller configured to operate such auxiliary burner(s) "after the glass preform . . .has reached a predetermined size." In rejecting claim 2, the Examiner asserted "[i]t would have been obvious to have all the features automatically controlled [by a controller] . . . [and] to have the controller do the controlling at all times—including whenever the size is at a predetermined size." Applicant respectfully disagrees. Nevertheless, Applicant has amended claim 2 to specify that the controller operates the auxiliary burners *only* after the glass preform has reached a predetermined size.

Claim 3 depends from dependent claim 2 and more particularly defines the auxiliary burners to include "one or more pairs of auxiliary burners, located on opposite sides of the main deposition burner and spaced circumferentially around the support mandrel. In rejecting claim 3, the Examiner referred to FIG. 3 of the Spainhour patent and he asserted that it would have been obvious to have placed Berkey's auxiliary burners "on opposite sites [sic—sides] so as to have the heat evenly balanced. Applicant respectfully disagrees. First, FIG. 3 of the Spainhour patent depicts just a single burner, not a main deposition burner and one or more pairs of auxiliary burners. Second, Berkey's "one or more auxiliary burners" are specified to be "employed to direct a flame toward one or both *ends* of the soot preform during deposition to

prevent breakage." Berkey patent, column 4, lines 38-41. Placing auxiliary burners at the *ends* of the preform is not the same as placing them *circumferentially* around the support mandrel.

Claim 4 depends from claim 1 and more particularly defines the apparatus to further include "a mount configured to withdraw the main deposition burner from the glass preform as the preform grows in size . . ." In rejecting claim 4, the Examiner asserted simply that it would have been obvious to make the burner adjustable. Applicant disagrees and requests the Examiner to cite a reference suggesting a flame hydrolysis apparatus of this kind incorporating a mount configured to withdraw a main deposition as the preform grows in size.

Claim 5 depends from claim 1 and more particularly defines the main deposition burner to further include a central reactant port and a plurality of flame ports arranged concentrically around such central reactant port and around the two divergent reactant ports. In rejecting claim 5, the Examiner asserted "84' are the flame ports," presumably referring to the ports 84' depicted in FIG. 11 of the Berkey patent. Applicant respectfully notes that the ports 84' actually are configured to function as shield gas ports, not as flame ports. Nevertheless, the Berkey patent does disclose a ring of flame ports 82 in FIG. 7 and 82' in FIG. 11. Regardless, such flame ports are not arranged around two divergent reactant ports, as defined in claim 5.

Claim 6 depends from claim 5 and more particularly defines the main deposition burner to further include a plurality of shield gas ports arranged between the central and divergent reactant ports and the flame ports. In rejecting claim 6, the Examiner asserted "82' are the shield gas ports," presumably referring to the ports 82' depicted in FIG. 11 of the Berkey patent. Applicant respectfully notes that the ports 82' actually are configured to function as flame ports, not as shield gas ports. Nevertheless, the Berkey patent does disclose a ring of shield gas ports 80 in FIG. 7 and 80' in FIG. 11. Regardless, such shield gas ports are not arranged around two divergent reactant ports, as defined in claim 6.

Claims 8 and 9 both depend from claim 5 and more particularly define at least some of the flame ports to direct the flame obliquely inwardly toward the burner's central axis (claim 8) or more particularly define the flame ports to direct the flame obliquely inwardly toward such central axis along one transverse axis but substantially parallel with such central axis along an orthogonal transverse axis (claim 9). The Examiner offered no additional

comments regarding rejected claims 8 and 9. Applicant respectfully requests the Examiner to explain how the Berkey and/or Spainhour patents show or suggest a flame hydrolysis apparatus incorporating a burner having these features.

Claim 10 depends from claim 5 and more particularly defines the apparatus to further include a valve that controls the delivery of reactant gases to the reactant ports according to the size of the glass preform being formed. In rejecting claim 10, the Examiner asserted "[i]t would have been obvious to have valves connected to all feeding passageways, so that one can turn of [sic] the burner when one is finished—and to adjust the feed rates so as to get the optimal rates." Applicant respectfully disagrees. Moreover, even if the Berkey/Spainhour apparatus were to be modified to include this feature, it still would lack the divergent reactant ports, as discussed above.

Claims 11 and 12 both depend from claim 1 and more particularly define the main deposition burner to be configured to burn a mixture of oxygen and natural gas (claim 11) or a mixture of oxygen and hydrogen (claim 12). In rejecting these claims, the Examiner asserted "[a]ny conduit is inherently configured to burn such mixtures." Applicant respectfully disagrees. Regardless, Applicant notes that the Examiner has failed to cited references that show or suggest a flame hydrolysis apparatus of the kind defined in parent claim 1 configured to burn either of these compositions.

Claim 23 depends from claim 5 and more particularly defines the apparatus to further include means for supplying reactant gases to the reactant ports and for supplying flame gases to the flame ports. In rejecting claim 23, the Examiner asserted "it is unclear what is meant by the means-plus-function language. It is deemed that the conduits that are used in Berkey are such means because they are means for transporting fluids." Applicant agrees that Berkey's conduits do, in fact, perform the functions of supplying reactant gases and flame gases, but notes that they do not supply such gases to reactant ports and flame ports as defined in parent claim 5.

Independent claim 13 defines a flame hydrolysis apparatus including, among other elements, a main deposition burner and one or more auxiliary burners. In rejecting claim 13, the Examiner asserted that the claim "is met as per the reasons given above." In addition, he asserted that the claim feature "the same longitudinal location" lacks an antecedent

basis and noted that "the burner impinges against many locations at different times—as the burner sweeps the length of the mandrel. In response to the Examiner's comments, Applicant has amended claim 13 to state "the main deposition burner and the one or more auxiliary burners are mounted relative to the support mandrel at substantially the same longitudinal location." The amended language has a meaning substantially the same as the original language, but should avoid the Examiner's objections.

The Berkey and Spainhour patents, together, fail to disclose a flame hydrolysis apparatus incorporating the recited main deposition burner and one or more auxiliary burners, mounted relative to the mandrel at substantially the same longitudinal location. As discussed above in connection with claim 3, Berkey's one or more auxiliary burners are located at "one or both *ends* of the soot preform." As such, the auxiliary burner(s) would *not* be located at "substantially the same longitudinal location" relative to the support mandrel. Moreover, it would not have been obvious to have moved such auxiliary burner(s) to the same longitudinal location as the main deposition burner, because such a modification would be inconsistent with Berkey's stated desire to heat "one or both *ends* of the soot preform during deposition to prevent breakage."

Claim 14 depends from independent claim 13 and more particularly defines the main deposition burner to be configured to direct one or more streams of soot-forming reactants substantially quasi-tangentially toward the glass preform. As discussed above in connection with claim 1, the Berkey and Spainhour patents fail to disclose a flame hydrolysis apparatus incorporating such a burner.

Finally, claim 24 depends from independent claim 13 and more particularly defines the apparatus to further include means for supplying reactant gases to the reactant ports and for supplying flame gases to the flame ports. In rejecting claim 23, the Examiner asserted "it is unclear what is meant by the means-plus-function language. It is deemed that the conduits that are used in Berkey are such means because they are means for transporting fluids." Applicant agrees that Berkey's conduits do, in fact, perform the functions of supplying reactant gases and flame gases, but notes that they do not supply such gases to a main deposition burner or auxiliary burner(s) as defined in parent claim 13.

For all of these reasons, the § 103(a) rejections of claims 1-6, 8-14, and 23-24 based on the Berkey and Spainhour patents are improper and should be withdrawn.

The Rejection of Claims 1, 5, and 8 Based on the Cain and Spainhour Patents

In this rejection, the Examiner asserted that claims 1, 5, and 8 are obvious over the Cain patent in view of the Spainhour patent. Regarding the requirement in independent claim 1 that the main deposition burner include "a pair of *divergent* reactant ports," the Examiner asserted that the *convergent* ports of the Cain apparatus "*diverge* in a reverse direction," and he asserted alternatively that the axes defined by the convergent ports diverge from each other after they have crossed the burner's central axis.

The Examiner's reading of claim 1 on the disclosure of the Cain patent is creative, but wrong. Applicant certainly did not intend for the claim term "divergent" to encompass not only a relationship that is *divergent*, but also one that is *convergent*. Moreover, the Examiner's suggested construction for the claim term "divergent" ignores the claim requirement that the reactant ports diverge in a way that the two streams of soot-forming reactants "impinge substantially quasi-tangentially on the glass preform." Cain's apparatus is not configured to provide this feature. Moreover, the Examiner overlooks the fact that only the region 90 of Cain's apparatus is specified to emit reactants; the region 92 (or 168) is specified to emit a shield gas (nitrogen).

Regardless of the deficiencies in the Examiner's rejection of claim 1 based on the Cain and Spainhour patents, Applicant has amended claim 1 to specify that the pair of divergent reactant ports define axes that "immediately" diverge from the burner's central axis, thus excluding reactant ports that define convergent axes.

Claims 5 and 8 depend from independent claim 1, adding additional structural features that further distinguish over the Cain and Spainhour patents. These claims are discussed in order below.

Claim 5 more particularly defines the main deposition burner to further include a central reactant port and a plurality of flame ports arranged concentrically around such central

reactant port and around the two divergent reactant ports. In rejecting claim 5, the Examiner asserted merely that claim 5 is "clearly met." Applicant respectfully disagrees. To the extent the Cain apparatus includes flame ports, they are not arranged around two divergent reactant ports, as defined in claim 5.

Finally, claim 8 depends from claim 5 and more particularly defines the flame ports to direct the flame obliquely inwardly toward the main deposition burner's central axis. To the extent the Cain apparatus includes flame ports that direct the flame obliquely inwardly, they are not incorporated into a burner having the required central reactant port and pair of divergent reactant ports, as defined in parent claim 5.

For all of these reasons, the § 103(a) rejections of claims 1, 5, and 8 based on the Cain and Spainhour patents are improper and should be withdrawn.

Conclusion

This application should now be in condition for a favorable action. Allowance of the application is respectfully requested. If the Examiner believes that a telephone conference with Applicant's undersigned representative might expedite the prosecution of the application, he is invited to call at the number indicated below.

Respectfully submitted,

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